




# New records of Orthalicoidea land snail species for the state of Minas Gerais, southeastern Brazil (Gastropoda, Stylommatophora)

Rodrigo Brincalepe Salvador<sup>1\*</sup>, Luiz Ricardo L. Simone<sup>2</sup>

**1** Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand • [salvador.rodrigo.b@gmail.com](mailto:salvador.rodrigo.b@gmail.com)

 <https://orcid.org/0000-0002-4238-2276>

**2** Museu de Zoologia da Universidade de São Paulo, São Paulo, SP, Brazil • [lrsimone@usp.br](mailto:lrsimone@usp.br)  <https://orcid.org/0000-0002-1397-9823>

\* Corresponding author

## Abstract

New collection efforts in the limestone caves of Parque Nacional Cavernas do Peruaçu, Minas Gerais state, Brazil, has brought to light specimens belonging to three orthalicoid land snail species previously unrecorded from that state: *Kora nigra* Simone, 2015 and *Kora rupestris* Salvador & Simone, 2016 (Bulimulidae), and *Leiostracus subtuszonatus* (Pilsbry, 1899) (Simpulopsidae). All the above species were previously known from very restricted areas or just from their type locality. A possible record of *Streptartemon* aff. *cookeanus* (F. Baker, 1914) (Streptaxidae) is also reported herein.

## Keywords

Bulimulidae, Cavernas do Peruaçu, Simpulopsidae, Streptaxidae, troglotauna

**Academic editor:** Carl Christensen | Received 11 November 2020 | Accepted 28 February 2021 | Published 5 March 2021

**Citation:** Salvador RB, Simone LRL (2021) New records of Orthalicoidea land snail species for the state of Minas Gerais, southeastern Brazil (Gastropoda, Stylommatophora). Check List 17 (2): 395–399. <https://doi.org/10.15560/17.2.395>

## Introduction

The knowledge on the taxonomy and geographic distribution of terrestrial gastropods in Brazil is still in its infancy, although little by little the situation is being improved (Salvador 2019). Recent expeditions to Parque Nacional Cavernas do Peruaçu, located in Minas Gerais state, southeastern Brazil, have retrieved a reasonable number of specimens from cave environments, which are likewise understudied in the country (e.g., Pinto-da-Rocha 1995; Bichuette and Trajano 2008; Simone et al. 2020).

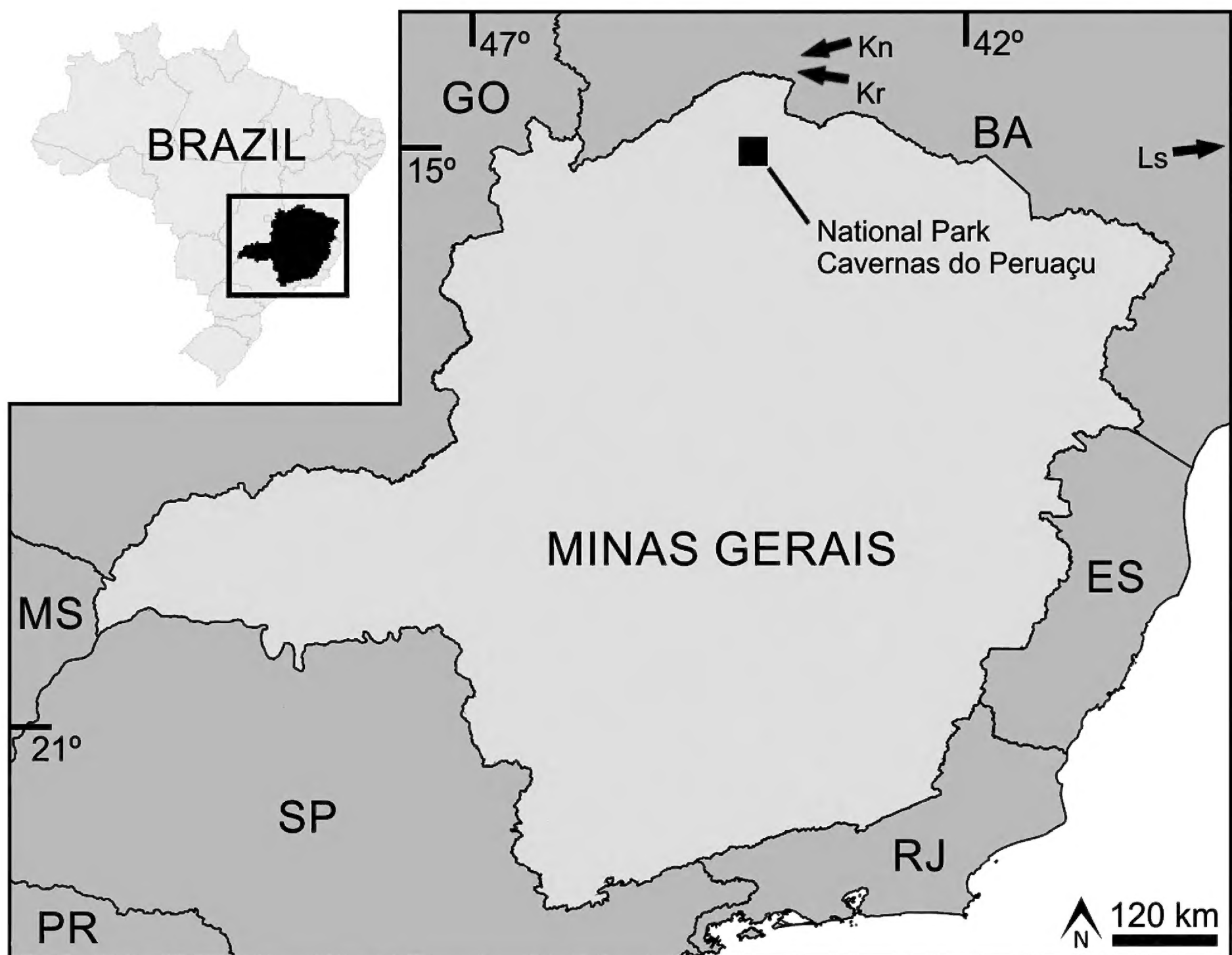
The Parque Nacional Cavernas do Peruaçu still contains large stretches of native vegetation, being a transitional zone between the Cerrado and Caatinga biomes and containing important cave systems, archaeological

sites, and remarkable animal biodiversity (Fundação Biodiversitas 2005; IBAMA 2005).

Herein, we present new records of three Orthalicoidea land snail species from the state of Minas Gerais, as recognized in new material from Parque Nacional Cavernas do Peruaçu. For each of these species, the new records represent large extensions to the known distribution.

## Methods

Expeditions to the Parque Nacional Cavernas do Peruaçu (Cavernas do Peruaçu National Park, 15°10'S, 044°22'W; Fig. 1) were conducted by Dr. Maria E. Bichuette and her team from Universidade Federal de São Carlos (UFSCar,



**Figure 1.** Map showing the location of Parque Nacional Cavernas do Peruaçu, Minas Gerais state, southeastern Brazil. The arrows indicate the previously known occurrences of *Kora nigra* (Kn), *Kora rupestris* (Kr), and *Leiostracus subtuszonatus* (Ls). Abbreviations of neighboring states: BA, Bahia; ES, Espírito Santo; GO, Goiás; MS, Mato Grosso do Sul; PR, Paraná; RJ, Rio de Janeiro; SP, São Paulo.

São Carlos, Brazil) on separate occasions from August 2012 to October 2015. They focused on the cave systems in the park and sampled diverse animal groups, although gastropods were an important part of the collection. They visited the following caves (names in Portuguese): Gruta do Janelão, Gruta Olhos d'Água, Lapa da Onça, Lapa do Branco I, Lapa do Branco IV, Lapa dos Sonhos, Mina d'Água, and Toca do Pedro. Visual searches for specimens were conducted, with the duration of active search being the same for each cave. The material collected during those expeditions comprised mostly dry, empty shells, with only very few animals collected alive and preserved in ethanol 70%.

Additionally, a brief collection effort was undertaken in February 2017 by a team from Instituto Ekos Brasil, which manages the park together with the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio). This second effort focused on two caves only (Gruta do Índio and Gruta do Janelão) and was based on visual search, collecting only larger empty shells.

All material from the above expeditions was donated to the collection of the Museu de Zoologia da Universidade de São Paulo (MZSP; São Paulo, Brazil). Species identification was conducted with the aid

of specialized literature: the catalog of Simone (2006), the original descriptions of the species, and further taxonomic works. Type material was consulted whenever possible, as well as additional comparative material in the MZSP collection.

The species that represent new records for Minas Gerais state are all stylommatophoran land snails belonging to superfamily Orthalicoidea. They are discussed below, arranged alphabetically. Further specimens collected in caves in Peruaçu during the above-mentioned expeditions do not represent new records for Minas Gerais state. For the sake of being thorough, the latter have been listed in the Appendix.

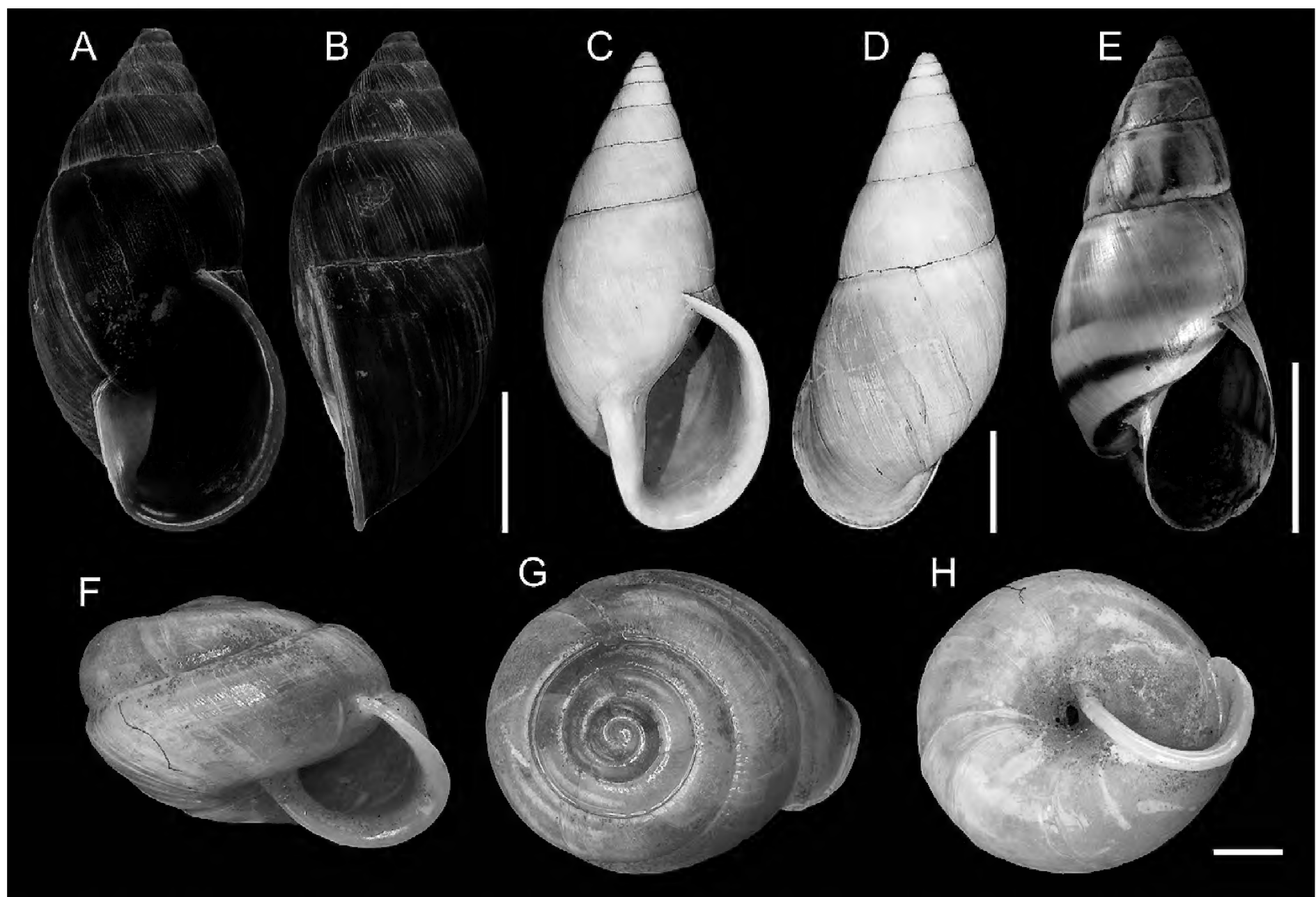
## Results

### Family Bulimulidae

#### *Kora nigra* Simone, 2015

Figure 2A, B

**New records.** BRAZIL • Minas Gerais, Parque Nacional Cavernas do Peruaçu, Toca do Pedro; 10.IV.2015; M.E. Bichuette et al. leg.; 1 shell, MZSP 150139.



**Figure 2.** Terrestrial gastropods newly recorded from Parque Nacional Cavernas do Peruaçu, Minas Gerais state, Brazil. **A, B.** *Kora nigra* (shell height = 35.7 mm); scale bar = 10 mm. **C, D.** *Kora rupestris* (shell height = 44.0 mm); scale bar = 10 mm. **E.** *Leiostracus subtuszonatus* (shell height = 27.5 mm); scale bar = 10 mm. **F–H.** *Streptartemon* aff. *cookeanus* (shell width = 4.9 mm); scale bar = 1 mm.

This species was known only from its type locality: a cave in Carinhanha municipality, Bahia state (Simone 2012; Birckolz et al. 2016). The present record extends the species distribution circa 100 km to the south (Fig. 1).

**Identification.** The present specimen can be identified by its bulimoid shell, with an initially smooth protoconch that becomes sculptured by well-marked, sinuous axial ribs later on that gradually increase in strength towards the teleoconch (Salvador and Simone 2016). It can be distinguished from its congeners by its broad shell, with a dark brown coloration (Simone 2015; Salvador and Simone 2016).

#### *Kora rupestris* Salvador & Simone, 2016

Figure 2D, E

**New records.** BRAZIL • Minas Gerais, Parque Nacional Cavernas do Peruaçu, Gruta do Janelão; 10.II.2017; M.C. Salvador leg.; 8 shells, MZSP 137981.

This species was known from a very restricted range of three municipalities in southern Bahia state, from a biome similar to that reported here (Birckolz et al. 2016; Salvador and Simone 2016). The present record extends the species distribution circa 100 km to the south (Fig. 1).

**Identification.** As *K. nigra* above, but it can be distinguished from the former due to its much narrower shell profile and lighter color (Salvador and Simone 2016).

#### Family Simpulopsidae

##### *Leiostracus subtuszonatus* (Pilsbry, 1899)

Figure 2E

**New records.** BRAZIL • Minas Gerais, Parque Nacional Cavernas do Peruaçu, Gruta do Janelão; 10.II.2017; M.C. Salvador leg.; 1 shell, MZSP 137982.

This species was known with certainty only from Ilhéus municipality in southeastern Bahia state, from the Atlantic Forest biome (Salvador and Cavallari 2013). The present record extends the species distribution circa 550 km to the west (Fig. 1) and also represents the first report of this species in a transitional Cerrado/Caatinga biome.

**Identification.** The present specimen, despite being worn, can be identified by its bulimoid shell with a flame-like color pattern, also presenting wide whitish and brown spiral bands on the abapical portion of the body whorl (Salvador and Cavallari 2013). The protoconch is sculptured by fine parallel axial wrinkles on its apical portion and by extremely fine, parallel spiral lines on its remaining surface (Salvador and Cavallari 2013).

#### Discussion

One of the species reported here, *Kora nigra*, is apparently an obligate cave dweller, as all its documented



occurrences stem from caves (Salvador and Simone 2016). To our knowledge, the present report of the other two species represents their first records from caves. In particular, the occurrence of *Leiostracus subtuszonatus* inside a cave is surprising, as it is considered an arboreal snail (Salvador and Cavallari 2013). However, given the poor condition of the shell, it is very likely that it has been transported there.

We have also encountered a specimen (shell only) of dubious identity from the cave known as Lapa do Branco I (specimen MZSP 150052; Fig. 2F–H), that we provisionally refer to *Streptartemon* aff. *cookeanus* (F. Baker, 1914). *Streptartemon cookeanus* is known from northeastern Brazil, from the states of Ceará, Rio Grande do Norte, and Paraíba (Simone, 2016), which is at least 1,000 km northeast of Parque Nacional Cavernas do Peruaçu. The present specimen is conchologically similar to *S. cookeanus* due to its relatively large aperture lacking apertural barriers. However, it has a smaller shell (about half the size), wider whorls, and a much more depressed spire; this could represent simply an extreme of morphological variation, but such shape is presently unknown among specimens of *S. cookeanus*. It is possible that the present specimen belongs to a still unrecognized species. In fact, a new species of *Streptartemon* that also resembles *S. cookeanus*, *S. waukeen* Salvador & Cunha, 2020, has recently been described from coastal areas in southeastern Brazil (Salvador and Cunha 2020). For the moment, we prefer the more cautious approach of leaving this specimen in open nomenclature until further material is collected.

The present report improves the knowledge of the geographic distribution of land snails in eastern Brazil, found in one of the most important national parks in the country (IBAMA 2005). Better information about species ranges, especially of potential troglobionts such as *K. nigra*, is the starting point to enable better informed protection measures and legislation (Salvador 2019).

## Acknowledgements

We are deeply grateful to Maria Elina Bichuette and her team (UFSCar) and, in memoriam, Maria Cristina Salvador and Ernesto Moeri (Ekos Brasil) for providing the material studied herein; to José H. Fontenelle (Orquidário de Santos) for the help in identifying the specimens of megasnails; and to Juan F. Araya, Carl Christensen, Timothy Pearce, and an anonymous reviewer for their helpful suggestions. This work was partly supported by a doctoral grant from Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq, Brazil, proc. #245575/2012-0) to RBS.

## Authors' Contributions

RBS led the taxonomic study and manuscript writing. Both authors contributed to the writing of the manuscript.

## References

- Bichuette ME, Trajano E (2008) Diversity of *Potamolithus* (Littorini-morpha, Truncatelloidea) in a high-diversity spot for troglobites in southeastern Brazil: role of habitat fragmentation in the origin of subterranean fauna, and conservation status. *Subterranean Biology* 25: 61–88. <https://doi.org/10.3897/subtbiol.25.23778>
- Birckolz CJ, Salvador RB, Cavallari DC, Simone LRL (2016) Illustrated checklist of newly described (2006–2016) land and freshwater Gastropoda from Brazil. *Archiv für Molluskenkunde* 145 (2): 133–150. <https://doi.org/10.1127/arch.moll/145/133-150>
- Bouchet P, Rocroi JP, Hausdorf B, Kaim A, Kano Y, Nützel A, Parkhaev P, Schrödl M, Strong EE (2017) Revised classification, nomenclator and typification of gastropod and monoplacophoran families. *Malacologia* 61: 1–526. <https://doi.org/10.4002/040.061.0201>
- Calcutt J, Cuzzo MG, Jackson M, Salvador RB (2020) Phylogenetic relationships and classification of Solaropsidae (Gastropoda: Stylomatophora). *Archiv für Molluskenkunde* 149(2): 181–193. <https://doi.org/10.1127/arch.moll/149/181-193>
- Cuzzo MG, Pena MS (2017) *Minaselates*, a new genus and new species of Epiphragmophoridae from Brazil (Gastropoda: Stylomatophora: Helicoidea). *Zoologia* 34: e13230. <https://doi.org/10.3897/zoologia.34.e13230>
- Fundação Biodiversitas (2005) Biodiversidade em Minas Gerais: um atlas para sua conservação. Segunda edição. Fundação Biodiversitas, Belo Horizonte, Brazil, 92 pp.
- IBAMA (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis) (2005) Plano de manejo do Parque Nacional Cavernas do Peruaçu. Volume I: encartes 1, 2 e 3. Edições IBAMA, Brasília, Brazil, 53 + 134 + 456 pp.
- Pinto-da-Rocha R (1995) Sinopse da fauna cavernícola do Brasil (1907–1994). *Papéis Avulsos de Zoologia* 39 (6): 61–173.
- Salvador RB (2019) Land snail diversity in Brazil. *Strombus* 25: 10–20.
- Salvador RB, Cavallari DC (2013) Taxonomic revision of *Leiostracus onager* and *Leiostracus subtuszonatus* (Gastropoda: Pulmonata: Orthalicidae). *Journal of Conchology* 41: 511–518.
- Salvador RB, Cunha CM (2020) A new species of *Streptartemon* from southeastern Brazil (Gastropoda: Streptaxidae). *Journal of Conchology* 43: 513–519.
- Salvador RB, Simone LRL (2016) A new species of *Kora* from Bahia, Brazil (Gastropoda: Pulmonata: Orthalicidae), with an emended diagnosis of the genus. *Stuttgarter Beiträge zur Naturkunde A, Neue Serie* 9: 1–7. <https://doi.org/10.18476/sbna.v9.a1>
- Salvador RB, Silva FS, Cavallari DC, Simone LRL (in press) Terrestrial Gastropoda from the caves of Presidente Olegário, southeastern Brazil. *Biota Neotropica*.
- Simone LRL (2006) Land and freshwater mollusks of Brazil. EGB/FAPESP, São Paulo, Brazil, 390 pp.
- Simone LRL (2015) Three new species of *Kora* (Pulmonata, Orthalicidae) from Bahia and Minas Gerais, Brazil. *Journal of Conchology* 42: 51–56.
- Simone LRL, Salvador RB (2016) Taxonomical study on a sample of land snails from Nanuque (Minas Gerais, Brazil), with descriptions of three new species. *Stuttgarter Beiträge zur Naturkunde A, Neue Serie* 9: 9–30. <https://doi.org/10.18476/sbna.v9.a2>
- Simone LRL, Cavallari DC, Salvador RB (2020) A new troglobite species of *Habeastrum* Simone, 2019 from Brazil, and support for classification in Diplommatinidae (Mollusca, Caenogastropoda). *Zoosystematics and Evolution* 96: 639–647. <https://doi.org/10.3897/zse.96.53880>

## Appendix

Further specimens collected in caves in Peruaçu during the expeditions reported here include representatives of the freshwater species *Idiopyrgus souleyetianus* Pilsbry,

1911 (Pomatiopsidae), as well as the following terrestrial taxa: *Helicina brasiliensis* Gray, 1824 (Helicinidae), *Habeas* sp. (Diplommatinidae), *Happia vitrina* (J.A. Wagner, 1927) (Scolodontidae), *Megalobulimus oblongus* (O.F. Müller, 1774) (Strophocheilidae), *Bulimulus tenuissimus* (d'Orbigny, 1835) (Bulimulidae), *Cyclodontina inflata* (Wagner, 1827) (Odontostomidae), *Habroconus semenlini* (S. Moricand, 1846) (Euconulidae), and *Minaselates paradoxa* Cuezze & Pena, 2017 (Epiphragmophoridae, following new family rank assignment by

Calcutt et al. 2020). All the species above are already known from Minas Gerais state (Simone 2006; Birckolz et al. 2016; Simone and Salvador 2016; Cuezze and Pena 2017; Salvador et al. in press). Further juvenile or fragmentary specimens of the families Achatinidae (*Lamel-laxis* sp., *Obeliscus* sp.), Streptaxidae, Bulimulidae (*Drymaeus* sp.), Simpulopsidae (*Rhinus* sp.), and Scolodontidae were likewise recovered, but their partial shells preclude precise identification.